REMARKS

Claims 1-21 are pending. Claims 14-17 are withdrawn from consideration as being drawn to a non-elected invention. Claim 21 has been newly added. Reconsideration and allowance of the present application based on the following remarks are respectfully requested.

Applicants are pleased to note the Examiner indicated that claims 3-9 are allowed.

Claim Rejection – 35 USC § 102

Claims 1, 2, and 10-13 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Oshida et al. (US Pat. No. 4,862,008). Applicants respectfully traverse this rejection for at least the following reason.

The Office Action contends that Figure 4A in Oshida et al. shows all the elements recited in claim 1, and in particular an alignment system including an excitation source for producing electromagnetic radiation (reference light 501') to a surface of the substrate to induce a wave in a region of a buried substrate alignment mark (Fig. 14A and col. 11 lines 34+), and a measurement system to direct a measurement beam (reflected laser light 514).

In response to the arguments filed April 3, 2003, the Office Action contends that Applicants argument that FIG. 14A does not show a buried alignment mark is not persuasive, and that the figure clearly shows an alignment mark covered by a resist layer 43 that is detected by the alignment system as shown in FIG. 4. Applicants respectfully disagree.

Applicants reiterate the arguments filed April 3, 2003. Moreover, contrary to the Office Action contention that Oshida et al. teaches an alignment system including an excitation source for producing electromagnetic radiation (reference light 501') to a surface of the substrate to induce a wave in a region of a buried substrate alignment mark, the light beam 501' in Oshida et al. is not an excitation light but simply a reference light or hologram illumination used to create a hologram (see, col. 4, line 62 through col. 5, line 7, and col. 7, lines 47-48 in Oshida et al.). Moreover, contrary to the Office Action contention, the light beam 501' does not induce a wave in a region of buried substrate alignment mark. Indeed, the hologram (created with light 501') in Oshida et al. is simply used to record information regarding intensity and phase of light after reflection or transmission through an object such as the reduction lens and thus to compensate for aberrations of the reduction lens at the alignment wavelength (see col. 2, lines 12-47 in Oshida et al.).

The optical alignment system of Oshida et al. simply detects an alignment mark on a wafer through the exposing lens (TTL detection) of the projection system. In order to align the wafer relative to the alignment mark, Oshida et al. uses a hologram in one of the alignment irradiation means and the alignment detection means to compensate for wave front aberration of the exposure lens at the alignment wavelength (see col. 2, lines 12-31 in Oshida et al.). This, according to Oshida et al., allows the alignment light reflected by the alignment mark to be detected with a high focusing ability (see col. 2, lines 43-47 in Oshida et al.).

Consequently, Oshida et al. does not disclose, teach or suggest, *inter-alia*, "an excitation source for directing electromagnetic radiation to a surface of said substrate so as to induce a wave therein in a region of an at least partially buried substrate alignment mark," much less "a measurement system to direct a measurement beam to be reflected by said surface and to detect surface effects caused by said wave thereby to perform an alignment to said substrate alignment mark."

The alignment system recited in claim 1 allows achieving accurate alignment for process steps in a manufacturing procedure without accumulating overlay errors from earlier steps and without the need for clearout steps on layer covering the alignment mark and without the use of a hologram to compensate for aberrations in the projection lens as in the case of Oshida's alignment system. Consequently, Oshida et al. does not disclose, teach or suggest the subject matter recited in claim 1.

Therefore, Applicants respectfully submit that claim 1, and claims 2, 10-13 which are dependent from claim 1, are patentable and respectfully request that the rejection of claims 1, 2, and 10-13 under § 102(b) be withdrawn.

Claims 18-20 are rejected under 35 U.S.C. § 102(e) as being allegedly anticipated by Shiraishi (US patent No. 6,285,455). Applicants respectfully traverse this rejection for at least the following reason.

The Office Action contends that Shiraishi shows a lithographic projection apparatus including a radiation system (illumination optical system 1), a support structure (reticle stage 2), a substrate table (workpiece table 5) for holding a substrate (wafer 4), a projection system (projection lens PL), and an alignment system including an excitation source (laser beam L1) and a measurement system (including photoelectric detector 16) for detecting a buried alignment mark (alignment mark 26) that is buried by a process layer (polysilicon film 27).

While Applicants agree that Shiraishi discloses an alignment sensor 3 including a laser beam source 10 and a photodetector 16 (Figure 1 of Shiraishi), Shiraishi however does not disclose, teach or suggest an alignment system including an excitation source for directing electromagnetic radiation to a surface of a substrate so as to induce a wave therein in a region of an at least partially buried substrate alignment mark, and a measurement system to direct a measurement beam to be reflected by the surface and to detect surface effects caused by the wave thereby to perform an alignment to the substrate alignment mark.

Indeed, Shiraishi merely teaches a mark detection method for detecting the position of an alignment mark 26 wherein the alignment mark is irradiated with one coherent beam L2 (or L1) or two mutually coherent beam LA and LB and detecting the diffracted light LDA, LDB or LD produced by the mark 26 and determining the position of the mark 26 on the basis of the received diffracted light (see col. 2, lines 35-48 in Shiraishi).

Consequently, for at least the above reasons, Shiraishi does not disclose, teach or suggest the subject matter recited in claim 18.

Therefore, Applicants respectfully submit that claim 18, and claims 19 and 20 which are dependent from claim 18, are patentable and respectfully request that the rejection of claims 18-20 under § 102(e) be withdrawn.

Claim 21 has been newly added. Support for the claim language can be found throughout the original disclosure. Claim 21 recites, *inter-alia*, "said alignment system comprising: an excitation source for directing electromagnetic radiation to a surface of said substrate so as to induce a wave therein in a region of an at least partially buried and obscured substrate alignment mark."

For at least the reasons presented above in relation to claim 1, none of the relied upon prior art references discloses, teaches or suggests the subject matter recite in claim 21. Furthermore, none of the relied upon prior art discloses, teaches or suggests an excitation source for directing electromagnetic radiation to a surface of the substrate so as to induce a wave therein in a region of an at least partially buried and obscured substrate alignment mark. In contrast, the mark of Oshida et al. is not obscured because the light is reflected by the alignment mark (see col. 2, lines 45-47 in Oshida et al.).

Therefore, Applicants respectfully submit that claim 21 is allowable.

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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